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# THE USES OF BUSINESS GAMING IN EDUCATION AND LABORATORY RESEARCH

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## INTRODUCTION

The objectives of this paper are to evaluate a representative computer-based business game (1) as an educational tool, and (2) as a means for conducting laboratory research in the behavioral sciences.

The use of computer-based business games for educational and research purposes began in 1956 with the development of the AMA Top Management Decision Simulation Game.[1] Most of the early games were general or top management games, such as the IBM Management Decision-Making Laboratory and the UCLA Executive Game. Variations of these games are still in use in a good many companies and universities. Following the development of the AMA Top Management Game, many specialized or functional games came into existence, such as GE's Dispatch Game and Marketing Strategy Simulation Exercise, Kroger's Supermarket Decision Simulator, Tulane University's Production-Manpower Decision Game, and the University of Pennsylvania's Smart and Inventrol.[2] Currently, the only game that includes the qualities of both top management and functional games is the Carnegie Management Game, which was first tested in the classroom in 1959.[3]

Computer-based business games by definition represent a type of man-machine simulation. There are also a number of non-computer business games and simulations, including case analysis, role playing, and several kinds of situational tests.[4]

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[1] F. M. Ricciardi et al., Top Management Decision Simulation: The AMA Approach (American Management Association, 1957).

[2] K. J. Cohen and E. Rehnman, "The Role of Management Games in Education and Research," Management Science, Vol. 7, No. 2 (January, 1961), pp. 131-166.

[3] W. R. Dill and N. Doppelt, "The Acquisition of Experience in a Complex Management Game," Management Science, Vol. 10, No. 1 (October, 1963), pp. 30-46.

[4] D. W. Bray and D. L. Grant, "The Assessment Center in the Measurement of Potential for Business Management," Psychological Monographs, Vol. 80, No. 17 (Whole No. 625-1966).

Several years ago, Bass estimated that there were 100 or more computer-based business games of all varieties.[5] A considerably higher estimate was made by Dill and Doppelt.[6] At about the same time, a study by Dale and Klasson revealed that 64 of the 90 leading schools of business had integrated computer-based games into their curriculua since 1956.[7] Of the remaining 26 schools, 6 were planning to introduce games in the near future and 12 indicated that they would use them when resources were available. Comparable findings are reported in a more recent study by Graham and Gray.[8] In a short period of time, business gaming became in many respects the solution to the problem of how to provide the student with as much "real world" business experience as possible without actually placing him on the job.

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[5] B. M. Bass, "Business Gaming for Organizational Research," Management Science, Vol. 10, No. 3 (April, 1964), pp. 545-556.

[6] Dill and Doppelt, op. cit.

[7] A. G. Dale and E. R. Klasson, Business Gaming: A Survey of American Collegiate Schools of Business (Austin: Bureau of Business Research, University of Texas, 1964).

[8] R. G. Graham and C. F. Gray, Business Games Handbook (American Management Association, 1969).

LITERATURE REVIEW

Educational benefits and limitations. The benefits of business gaming have been reviewed by a number of authors.[9] There is general agreement among these authors that gaming increases the interest, involvement, and enthusiasm of participants. On this point, Martin has stated: "If the only contribution of management gaming were to arouse the enthusiasm of the student and stimulate his thinking about the problems associated with decision-making, the technique would be of great educational value."[10] Gaming also seems to increase participants' understanding of the interrelatedness of both physical and personal factors in a business, and provides rapid feedback on the impact of decisions, usually not available in the lecture, textbook, or case presentation. Finally, gaming may be more effective than other educational methods (especially the case method) for increasing the knowledge of management concepts and techniques and decision-making skills.

After reviewing the benefits of gaming, many of these same authors have also discussed the limitations of gaming. For example, the actual and opportunity costs of developing and running a game may be too high in comparison to the educational return. Participants may approach the simulation exercise as a game rather than a realistic business situation and thereby derive little benefit from

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[9]See, for example, J. M. Kibbee, "Dress Rehearsal for Decision Making: The Growing Use of Business Games," Management Review, Vol. 48, No. 2 (February, 1959), pp. 4-8, 71-73; E. W. Martin, Jr., "Teaching Executives Via Simulations," Business Horizons, Vol. 2, No. 2 (Summer, 1959), pp. 100-109; Cohen and Rhenman, op. cit.; Dill and Doppelt, op. cit.: A. R. Raia, "A Study of the Educational Value of Management Games," Journal of Business, Vol. 39, No. 3 (July, 1966), pp. 339-352; and C. Cherryholmes, "Some Current Research on Effectiveness of Educational Simulations: Implications for Alternative Strategies," American Behavioral Scientist, Vol. 10, No. 2 (October, 1966), pp. 4-7.

[10]Martin, ibid., p. 101.

it. The game model may be too simple or too complex. It may not adequately account for the qualitative differences in decision making among participants. The gaming technique, according to Dill, "may accentuate the problem that some bright young men already have when they go into industry. Now instead of 'thinking' they know how to run a company, they may really 'believe' from their experience with a game that they can . . ."[11]

The potentially positive and negative features of gaming are often presented together, primarily it seems because of the lack of sufficient evidence to either rule them in or rule them out as a sound educational device. Such an unsettled condition concerning the use of business games has existed since they were first introduced over a decade ago. A rather popular position at this time is to suggest the use of business games with a few other equally invalidated techniques, such as brainstorming and sensitivity training. Somehow, what one technique cannot provide will be provided by the other in order to complete the student's total educational experience.

Nearly all who have written about the use of business games in education have drawn attention to the need for more empirical research. Writing as early as 1961, Cohen and Rhenman said, "...we must again caution the reader that no objective empirical evidence has been amassed which proves either that these (management) concepts can actually be taught by the use of management games or that they can be taught more effectively by games than in some other ways."[12]

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[11] W. R. Dill, "Management Games for Training Decision Makers," in E. A. Fleishman (Editor), Studies in Personnel and Industrial Psychology (Homewood, Illinois: Dorsey-Irwin, 1967), pp. 216-227. Quotation from page 225.

[12] Cohen and Rhenman, op. cit., p. 151.

Five years later, Raia suggested that the proponents as well as opponents of gaming "are generally dissatisfied with the existing evidence. Surprisingly little empirical research has been undertaken to determine the educational value of this relatively new approach to business training."[13] Miner recently summarized it this way: "Despite business games having won widespread acceptance, both in the universities and in connection with company management development programs, there is practically no evaluative information available."[14]

Unfortunately, it seems the basic problem of insufficient evidence continues to be glossed over by such typical statements as: "Their value as training devices seems well established;"[15] and "There is considerable evidence that games, both of the general management and the specific function type, do have educational value."[16] These authors then cite the studies by McKenney, Dill and Doppelt, and Raia for support.[17] However, McKenney, Dill and Doppelt, and Raia (as quoted earlier) are among those who have taken a rather cautious position on gaming, pointing out both the possible benefits and limitations of this technique.

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[13] Raia, op. cit., pp. 339.

[14] J. B. Miner, Personnel and Industrial Relations (Macmillan, 1969), pp. 201.

[15] E. M. Babb, M. A. Leslie, and M. D. Van Slyke, "The Potential of Business-Gaming Methods in Research," Journal of Business, Vol. 39, No. 4 (October, 1966), pp. 465-472. Quotation from page 465.

[16] R. C. Meier, W. T. Newell, and H. L. Pazer, Simulation in Business and Economics (Prentice-Hall, 1969), pp. 207.

[17] McKenney, op. cit.; Dill and Doppelt, op. cit.; Raia, op. cit.

Use of business gaming in laboratory research. The potential use of business games for laboratory research in the behavioral sciences was first discussed, though briefly by Kibbee in 1959.[18] McKenney suggests that research on the decision-making behavior of participants developed concurrently with the development of gaming, because most game developers were experienced researchers.[19]

It is inappropriate, in a sense, to separate the behavioral dimensions of game play from the question of the educational value of gaming to participants. Behavior, attitudes, and learning are intimately related, and most studies involved with the collection and analysis of gaming data have encountered and often explored some portion of this phenomenon. On the other hand, the separation is frequently carried out in the literature, quite likely to indicate some shift in emphasis from one set of variables to another. Within the class of studies using business games for behavioral research might fall those of Dill et al., McKenney, especially his post-1962 studies, Bass, Potter, and Babb et al.[20]

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[18] Kibbee, op. cit.

[19] McKenney, op. cit.

[20] W. R. Dill, W. Hoffman, H. J. Leavitt, and T. O'Mara, "Experiences with a Complex Management Game," California Management Review, Vol. 3 No. 3 (Spring, 1961), pp. 38-51; McKenney ibid.; Bass, op. cit.; G. B. Potter, "An Exploratory Study of Psychological Factors in Business Simulation Games," unpublished Master's thesis, University of Illinois, 1965; Babb et al., op. cit.

The preliminary results from these studies suggest that, in general, participants' intellectual abilities, as measured by achievement and aptitude tests and grades, are not related to measures of team performance, such as profits, sales, or return on investment. Potter, for example, obtained a correlation of -.40 between grade-point average (GPA) and a criterion score of team success (return on investment), and correlations ranging from .07 to -.07 between the verbal, quantitative and total scores on the Admission Test for Graduate Study in Business (ATGSB) and return on investment. McKenney, on the other hand, found that above-average ability teams performed better than below-average ability teams and were most satisfied with several aspects of the game experience. It appears in this regard that participants' satisfactions with the game experience are closely associated with (a) the relative level of success achieved by the team, and (b) the compatability of the team in reaching game decisions.

Concerning the relationship of personality variables and team performance, Dill et al. found no relationship between four personality dimensions of participants as measured by the Myer-Briggs test and team profits. McKenney explored the relationship of need achievement to the number of recorded changes in team game plans. The results, however, were statistically insignificant. Potter obtained a correlation of .05 between need achievement and game success. Babb et al., in a farm-supply management game, found some relationship between sociability and emotional stability as measured by the Gordon Personal Profile and pricing behavior.

Babb et al. also noted a strong relationship between game success (profits as a percentage of sales) and emotional stability and cautiousness as measured by the Gordon Personal Inventory. Cautiousness was also related to real-life success, as determined by rankings of peer-participants and a consultant. Game success, on the other hand, was not related to real-life success. One explanation

offered for the lack of relationship between game and real-life success was the availability in the actual business situation of consultants to provide managerial assistance when needed. Other authors, among them Craft and Stewart[21] and Cohen and Rhenman,[22] have found no relationship between success in gaming and the business world, because, according to Cohen and Rhenman, "...existing games represent only a portion of the decision-making activities of the manager..."[23] Serious implications can also be drawn from this statement concerning the use of business gaming in business curricula.

Although a number of proposals have been made, it appears that few studies to investigate the effects of time and information constraints on game performance have actually been conducted. Among the reported studies dealing with this area of research are those of Babb et al. and McKenney (cited earlier). Babb et al. found in a dairy management game that level of information was most important in terms of managers' ability to make profits, and timeliness of information was most important in terms of managers' ability to make profits, and timeliness of information was second in importance. A significant aspect of this study, according to the authors, "was that priorities could be established by managers for the many specific pieces of information used for each decision."

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[21] C. J. Craft and L. A. Stewart, "Competitive Management Simulation," Journal of Industrial Engineering, Vol. 10, No. 5 (September-October, 1959), pp. 362-363.

[22] Cohen and Rhenman, op. cit.

[23] Cohen and Rhenman, ibid, p. 165.

"This facilitated the development of an information system for management uses."[24]

McKenney had faculty boards of directors stress a different message to each of three sets of competing teams. One message stressed profits, another team organization and operation, and the third the use of the game as a vehicle for long-term learning (versus a competitive economic exercise). Based on questionnaire responses after the game, however, only the profit message was consistently received by team members, and no attempt was made to compare team performance.

Several studies concerning the impact of structural variables on measures of team performance and member satisfactions have been conducted by Bass and his associates, using the Production Organization Exercise (POE).[25] Two of these studies were carried out in conjunction with a sensitivity training laboratory in an industrial firm. In both studies, the group that voluntarily formed or was directed to form a more egalitarian type of organizational structure showed, among other things, greater profits, a clearer understanding of company goals, and increased satisfaction with company operations. In another study, three "bottoms-up" firms designed to maximize member satisfactions as a goal competed against three "top-down" firms designed to maximize the adequacy of the organization's response to the external environment. At the end of game play, the "bottoms-up" firms scored higher than the "top-down" firms in regard to both goals.

Potter found that formally-elected leaders among MBA students at the beginning of game play were often not the sociometrically-chosen leaders at the end of game play. Those students who made a good impression and were acknowledged as leaders in the first meeting generally lost their "likeability" ratings as the game progressed. Potter also examined the interpersonal styles of the formally-elected and sociometrically-chosen leaders, as measured by the Least Preferred Coworker questionnaire (developed by Fiedler), and obtained essentially non-

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[24] Babb et al., op. cit., p. 466.

[25] Bass, op. cit.

significant results.[26]

The seeming dearth of behavioral science research with business games is attributed in part by Bass to the fact that the "typical game is not the tool with which to test specific individual cognitive processes, one by one, any more than a pilot plant is usually necessary to test the tensile strength of a particular alloy."[27] Simpler empirical procedures are available and being used for exploring such phenomena. On the other hand, Bass recommends the complex game "when we want to examine questions about the organizational mix, particularly of real men, processes, and materials as they interact."[28] He claims, however, that many business games are not complex enough to realistically tap the behavioral dynamics of the decision process.

METHODOLOGY

To achieve the objectives of this paper (i.e., to evaluate the business game as an educational tool and as a means for conducting laboratory research) approximately 200 junior and senior undergraduate students in a large intorductory marketing course were organized into seven-man teams to play the functional, computer-based Marksim game developed by Greenlaw and Kniffin.[29] It was possible with the use of seven-man teams to investigate the impact of congruent and incongruent leadership styles at two organizational levels on group performance and satisfactions. The external nature of the game task, in contrast to most

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[26] Potter, op. cit. See F. E. Fiedler, A Theory of Leadership Effectiveness (McGraw-Hill, 1967) for a further discussion of the Least Preferred Co-Worker questionnaire.

[27] Bass, op. cit., pp. 546.

[28] Bass, ibid., pp. 546.

[29] P. S. Greenlaw and F. W. Kniffin, Marksim: A Marketing Decision Simulation (International Textbook 1964).

experimental tasks, also allowed for considerable interaction among leaders and subordinates and solidification of leadership style patterns. In addition to playing the game, students attended each week two lectures given by one of the authors and two discussion section periods led by a graduate assistant.

The Markism game was selected for several reasons. It is one of a family of games developed by Greenlaw and his associates in the functional areas of marketing, production, and finance.[30] Because of certain procedural and technical similarities, it was felt that conclusions based on the Markism game could be generalized to encompass other functional games of this variety. Furthermore, the Marksim game provides a good approximation of a competitive market and the types of major decisions required of a firm in such a market. Finally, the number of decisions required is neither too small to be immaterial nor too large to be unwieldy. For each period of play, representing one quarter of a year, firm members must make decisions regarding production volume, product quality, product retail list price, national advertising expenditures, expenditures for advertising allowances to retailers, and the number of units of the product to be shipped to the firm's distribution centers. They also may decide to purchase certain types of marketing research information and/or repay any debt which may be outstanding.

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[30]The Prosim (production) game was developed by P. S. Greenlaw and M. Hottenstein (International Textbook, 1969). The Finansim (finance) game was developed by P. S. Greenlaw and W. Frey (International Textbook, 1967). It should be noted that in the Marksim game all teams are not competing with each other. Only three decision-making teams are assigned to each industry. Therefore, for example, with nine teams there would be three competing teams in each of three different industries.

Team Assignments and Structure. Team assignments in most instances were made within the existing discussion sections and were based on students' scores on the Least Preferred Co-Worker (LPC) questionnaire. It was necessary, however, to reasign some students with high LPC scores to balance team assignments.

The LPC questionnaire has been used by Fiedler and others as a measure of leadership style.[31] The respondent is asked to think of the person with whom he can work least well and to rate this person on a number of eight-point, bipolar-adjective scales (e.g., pleasant-unpleasant, helpful-frustrating, efficient-inefficient). The number of scales is usually 16. A high score is presumed to indicate a relationship-oriented style of leadership and a low score a task-oriented style of leadership.

Positions at three organizational levels were incorporated into the seven-man teams. The positions were Conglomerate President, Firm President, and Firm Vice-President. Accordingly, each team was composed of one conglomerate president, two firm presidents, and four vice-presidents. Roles for these positions were defined, as below, and communicated to team members prior to game play.

> Conglomerate President: Reviews all decisions, and can request reconsideration of a decision at the firm level. Has position power to veto goals and plans, and change any debt repayment decision. Ultimate operating responsibility, however, remains at the firm level, except for debt repayment.
>
> Firm President: Has responsibility for firm goals and plans. Has responsibility for assigning workload between himself and two firm vice-presidents. Can veto any decision made by firm vice-presidents.
>
> Firm Vice-President: Has responsibility for making decisions under direction of firm president.

It was possible with the approximately 200 students to form 28 seven-man teams. Fourteen students with the highest and fourteen students with the lowest LPC scores were assigned positions as conglomerate president. Students with the next highest and lowest LPC scores were assigned positions as

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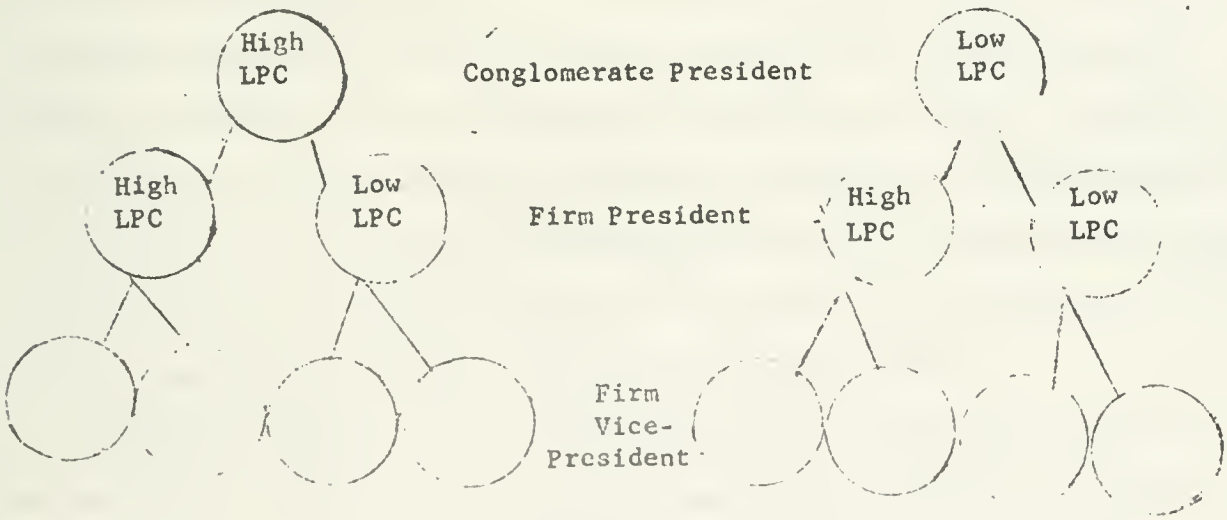
[31] Fiedler, op. cit.

firm president, with one high and one low LPC firm president reporting to each conglomerate president. LPC scores for the remaining students, in comparison to the others, were neither high nor low. These students were randomly assigned positions as firm vice-president.

The four types of team structure, derived in the manner described, are illustrated in Figure 1. It can be seen from Figure 1 that the seven-man teams contained two smaller three-man teams, each headed by a high or low LPC firm president, who reported either to a high or low conglomerate president, and two middle-range LPC (and randomly assigned) firm vice-presidents. The 28 seven-man teams, therefore, provided 56 three-man teams.

FIGURE 1

Four Types of Derived Team Structure




The LPC scores, it should be emphasized, were used primarily to determine team structure and thereby test hypotheses concerning leadership variables in a game situation, and secondly to control for these same variables on the results of game performance.

Procedures. After separate meetings with the conglomerate presidents and then the firm presidents and firm vice-presidents to define roles and review

game procedures, each three-man team was asked to prepare for approval by its conglomerate president a statement of goals and plans for achieving these goals. Following this, each three-man team was asked to submit, again through its conglomerate president, its first set of game decisions. Subsequent decision sets were submitted in the same manner approximately once a week until nine periods of play had been completed. The graduate assistants who served as discussion section leaders were instructed not to interfere with the decision making of any team. They could, however, respond to questions concerning general marketing principles and administration of the game.

Independent variables. In addition to the leadership style and structural variables discussed above, several more independent variables were introduced into the investigation. These were measures of three-man team performance (unrelated to game performance *per se*), and mean GPA. The measures of team performance were obtained after several periods of play and included the speed and accuracy with which each team performed two problem-solving tasks. The first task consisted of four mathematics problems and the second a modified version of the water-jar problem, known as the Gold Dust Problem.[32] Instructions for both tasks stressed that team members should work as rapidly and accurately as possible. A maximum of 15 minutes was allowed for each task.

Dependent variables. Measures of game performance were gathered for all periods of play on those items over which each three-man team was presumed to exercise control. These items included factory inventory costs, number of price changes, number of changes in national advertising expenditures, number of stockouts at retail, wholesale, and distribution centers, and ending owners' investment. Prior to a preliminary analysis of game performance data, measures for the

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[32] J. H. Davis and F. Restle, "The Analysis of Problems and a Prediction of Group Problem Solving," Journal of Abnormal and Social Psychology, Vol. 66, No. 2 (February, 1963), pp. 103-116.

first two periods of play were discarded in order to avoid any variance due to team members being unfamiliar with the game, each other, and/or their team assignments. Similar measures for the ninth period of play were also discarded in the event that the members of any team, sensing this was the last period of play, made unrealistic decisions. Correlational analysis of the data then indicated that ending owners' investment was clearly the single most appropriate measure of team game performance and, therefore, it replaced all the others in final data analysis.

Two more measures of game performance were obtained for the three-man teams. The first of these was an overall score, based primarily on a subjective evaluation of the team's reaction to changes in the market. Did the team, for example, appear to logically and effectively adjust its retail price to national advertising expenditures, and vice versa? The evaluation in each case was made, in consultation with the course faculty supervisor, by the graduate assistant responsible for the discussion section in which the team was predominatly located. The second measure was the mean course grade. (Underlying the inclusion of this variable, of course, was the assumption that some relationship existed between game performance and course grade.)

Finally, through a post-game questionnaire, perceptions of the game experience were solicited from members of the seven-man teams by position level (i.e., conglomerate president, firm president, and firm vice-president). The questionnaire was composed of several statements. Each statement was set against an eight-point scale, and the scale ranged in all but three instances from very true to very untrue. There were eight statements common to all position levels. These statements were (1) I felt anxious and tense, (2) The Marksim task was interesting, (3) It was sometimes difficult to communicate with my group, (4) The task provided a real challenge, (5) It was important to

me that my firm be among the most effective, (6) I enjoyed working with the other group members, (7) The task was often very frustrating, and (8) The Marksim project provided a valuable learning experience for skills in the business world.

Three additional statements were included in the questionnaire form for the conglomerate presidents to obtain their perceptions of overall (seven-man) team performance, their own performance as a leader, and the performance of their firm presidents. The questionnaire form for the firm presidents contained nine additional statements, five of them concerning their perceptions of the conglomerate president's performance. Seven additional statements were included in the form for the firm vice-presidents. These statements dealt with their perceptions of the firm president's performance, overall (three-man) team performance, and team atmosphere.

It was felt in regard to the experimental design of the investigation that the use of students, the formation of these students into artificial groups, the exercise of minimum control over team activities, and the allocation of a relatively short time period for game play were not limiting factors. In fact, they represented the usual conditions under which business games are played.

Guiding hypotheses. The literature review and the discussion of methodology so far suggest that a few broad and exploratory hypotheses guided our research efforts. These hypotheses are listed below.

1. Perceptions of the game (how interesting, challenging, and valuable as a learning experience) will be positively related to game performance.
2. Perceptions of team atmosphere and one's performance as a leader will be positively related to game performance.
3. Past team performance on certain tasks will predict future performance on similar tasks. (That is, team performance on the two problem-solving tasks and mean GPA will predict game performance and mean course grade.)

4. Combinations of leaders with task-oriented and relationship-oriented styles of leadership will differentially affect the perceptions of team members concerning the game (how interesting, challenging, valuable as a learning experience), team atmosphere, and the performance of the leader.[33]

5. Combinations of leaders with task-oriented styles of leadership will differentially affect team performance.

RESULTS

The data reported in Table 1 deal with relationships between measures of three-man team performance and post-game perceptions of the game. Significant positive correlations (at the .05 level) are noted between assigned game score and

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All tables (Tables 1-5 are attached)

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firm presidents' perceptions of the task as interesting, and the project as providing a valuable learning experience. A significant positive correlation is also noted between the assigned game score and firm vice-presidents' perceptions of the task as often frustrating. Several hypothesized relationships, however, are not observed. For example, significant positive correlations are not found between either measure of team game performance and vice-presidents' perceptions of the task as interesting and/or the project as a valuable learning experience.

[33]For a related discussion of this topic, see S. M. Nealey and F. E. Fiedler, "Leadership Functions of Middle Managers," Psychological Bulletin, Vol. 70, No. 5 (November, 1968), pp. 313-329.

For vice-presidents, the way the game was played was apparently more important than whether the team won or lost.

Table 2 is similar to Table 1, but reports relationships between measures of team performance and perceptions of team atmosphere and the leader. Common to both the firm president and firm vice-presidents are significant positive correlations between game performance (assigned game score and ending owners' investment) and an overall rating of firm performance. This is the obvious finding that the better the game performance, the more favorable the perception of that performance.

For the firm president, we find significant positive correlations between ending owners' investment and his rating of himself as a leader. One might speculate that when the team performed poorly, the firm president either felt it was not important to be effective or he reduced dissonance by saying it was not important. In this regard, the firm president seems to feel responsible for good team performance, but not responsible for poor performance. For the firm vice-presidents, the data indicate that if the team performed well, they perceived a favorable team atmosphere. The direction of causality, of course, is not clear.

Relationships between predictor variables and measures of team performance are reported in Table 3. The results show that none of the predictor variables are related to ending owners' investment. However, significant negative correlations are found between successful completion of the Gold Dust Problem and the assigned game score and mean course grade. Apparently, the better the team's performance, the less apt were team members to successfully complete the Gold Dust Problem. A significant positive correlation exists between mean GPA and the assigned game score. The ability to do mathematics problems is not significantly related to either assigned game score or ending owners' investment. It is related, however, to mean course grade. Therefore, although the ability to do mathematics problems does not predict game performance in this situation, it predicts mean course grade.

Results of an analysis of variance between LPC scores of conglomerate and firm presidents and team members' (firm vice-presidents') post-game perceptions of the game, team atmosphere, and the leader are shown in Table 4. None of the F ratios are significant at the .01 level. Three ratios, however, are significant at the .05 level and three are significant at the .10 level.

It appears from one ratio significant at the .05 level that with high LPC or relationship-oriented firm presidents (regardless of the leadership style of the conglomerate president), team members perceived the game as a valuable learning experience. Conversely, with low LPC firm presidents, team members perceived the game as having little or no value as a learning experience. Beyond this, the styles or combinations of styles of leadership among conglomerate and firm presidents apparently had little to do with team members' perceptions of the game (how interesting, challenging, and frustrating). How might this result be explained? Perhaps, as one explanation, the game as a "total experience" versus a "one-time task" had broader meaning for team members and included the opportunity for social interaction (and learning) provided by the high LPC firm presidents.

In regard to perceptions of team atmosphere and the leader (firm president), two ratios significant at the .05 level and three ratios significant at the .10 level suggest that when high LPC firm presidents interacted with high LPC conglomerate presidents, team members enjoyed working with other members of the team, perceived close agreement among team members on game decisions, and perceived the firm president as considerate, as effective in helping them reach decisions, and successful in motivating them to perform well. In general, therefore, combinations of relationship-oriented leaders at two organizational levels are associated in this investigation with favorable team members' perceptions of team atmosphere and the immediate superior.

Table 5 reports the results of an analysis of variance between LPC scores of conglomerate and firm presidents and team performance. The results are not statistically significant and suggest that team performance in this case was not affected by any combination of relationship or task-oriented leaders.

DISCUSSION

Business gaming in education. This investigation was designed in part to evaluate a representative computer-based business game as an educational tool. More specifically, it addressed itself to the question: "Is there a positive relationship between performance in a marketing game and performance in an introductory marketing course, as signified by the grade in that course?" Clearly, the results indicate no evidence in support of such a relationship. In fact, if there was any chance of a positive relationship between game and course performance, this investigation leaned over backwards to pick it up by awarding extra points for good game performance in determining course grade.

Several predictor variables were included in the investigation to ascertain their possible relationships to three measures of team performance. The main conclusion that must be drawn from the results is that there are strong individual and group factors brought to the game that are more critical in determining game performance than anything that might be learned in playing the game itself.

The above finding, coupled with the finding concerning the lack of relationship between game performance and course performance, leaves us, it seems, with only two further justifications for the use of a computer-based business game in a situation similar to that found in this investigation: (1) favorable perceptions of the game as a valuable learning experience, and (2) favorable perceptions of the course in which the game experience occurred. Unfortunately, only firm presidents whose teams performed well perceived the game as a valuable learning experience. Finally, if opinions about the course were already at a

high level, the game did not appear to raise them. This conclusion can be reached from the results of a standardized course evaluation questionnaire administered at the end of each semester. For the semester just prior to the use of the Marksim game, students' ratings of the course were in general more favorable than they were for the semester in which the game was played.

Like other educational techniques that have preceded it and are certain to follow, business gaming, it seems, does not provide the educational panacea envisaged by its most ardent advocates.

Business gaming in research. While serious questions have been raised regarding business gaming as an educational tool, it does appear to hold some promise for laboratory research in the behavioral sciences.

The results of this investigation suggest that different leadership styles and combinations of leadership styles within hierarchically-structured groups affect members' perceptions of the task and other aspects of the task environment. Our results, in this regard, are in general agreement with those obtained by Hunt and Nealey, who used similarly structured seven-man teams of students as subjects for performing two short-term tasks in a laboratory setting, and Wood and Sobel, who investigated the effects of congruent and incongruent leadership styles of first and second-level managers in 21 United States Post Offices.[34] Our results, on the other hand, are not in agreement with those obtained by

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[34] J. G. Hunt and S. M. Nealey, "A Laboratory Investigation of the Effects of Leadership Style Interactions of Two Levels of Management," unpublished manuscript, University of Illinois, 1967. M. T. Wood and R. S. Sobel, "Effects of Similarity of Leadership Style at Two Levels of Management on the Job Satisfaction of the First Level Manager," Personnel Psychology (in press).

Nealey and Blood in a study of nursing supervisors in a Veterans Administration hospital.[35] That is, subordinates in this study were more satisfied when supervised by nurses with incongruent leadership styles than by nurses with congruent leadership styles.

The divergent results of the Nealey and Blood study might be explained in part by the essentially unstructured nature of the nursing task in that study versus the essentially structured nature of the laboratory tasks used by Hunt and Nealey and the task Wood and Sobel encountered in their investigation of Post Office managers. Perhaps in a structured task situation, therefore, in which task success is more certain (or perceived as meaningless or unrewarding), subordinates will seek and obtain satisfactions primarily through harmonious interpersonal relationships. Harmonious interpersonal relationships in such a situation are facilitated by managers with congruent rather than incongruent leadership styles. Conversely, perhaps, in an unstructured task situation in which task success is more uncertain (or perceived as meaningful or rewarding), subordinates will seek and obtain satisfactions primarily through the outcomes of successful task performance. Managers with incongruent leadership styles may create a climate more conducive to successful task performance in an unstructured task situation.

The availability of potentially intrinsic and/or extrinsic satisfactions to subordinates within the task situation, it appears, determines to a considerable extent the most desirable combinations of managerial leadership styles at two

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[35] S. M. Nealey and M. R. Blood, "Leadership Performance of Nursing Supervisors at Two Organizational Levels," Journal of Applied Psychology, Vol. 52, No. 5 (October, 1968), pp. 414-422.

adjacent organizational levels. This factor may also explain why the results of the present study are comparable to those obtained by Hunt and Nealey, even though the present study provided a much longer time period for the formation and solidification of leader-member relationships and task performance. This line of reasoning is similar to that contained in the instrumentality-expectancy models of Vroom, Porter and Lawler, Graen, and others.[36] We could anticipate different results under the same leadership conditions, therefore, with a more complex, meaningful, or rewarding business gaming task.

The usually extended length of the business gaming experience enables the researcher to experimentally manipulate a number of situational variables and to explore the dynamic interaction and impact of these variables on group performance and satisfactions. We have discussed and illustrated, we believe, some ways in which business games can be used for conducting laboratory research in the behavioral sciences. Our results, although preliminary, may have some significance for those interested in organizational design and the selection and development of leaders for first and second-level managerial positions.

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[36] V. H. Vroom, Work and Motivation (Wiley, 1964); L. W. Porter and E. E. Lawler, Managerial Attitudes and Performance (Homewood, Illinois: Dorsey-Irwin, 1968); G. Graen, "Instrumentality Theory of Work Motivation: Some Experimental Results and Suggested Modifications," Journal of Applied Psychology Monograph, Vol. 53, No. 2, Part 2 (April, 1969). Additional extensions of these models are suggested in J. P. Campbell et. al., Managerial Behavior, Performance and Effectiveness (McGraw-Hill, 1970).

TABLE 1

Correlations between Team Performance and

Post-Game Perceptions of the Game

| Post-Game Perceptions | Team Performance | | |
|---|---|---|---|
| | Assigned Game Score | Ending Owners' Investment | Mean Course Grade |
| Firm President | | | |
| Task (game) was interesting | .42* | .34 | -.25 |
| Task provided a real challenge | .15 | .03 | .01 |
| Task was often very frustrating | .23 | .29 | .11 |
| Project provided a valuable learning experience | .39* | .07 | -.09 |
| Firm Vice-Presidents | | | |
| Task (game) was interesting | .00 | .25 | .30 |
| Task provided a real challenge | -.09 | .06 | -.15 |
| Task was often very frustrating | .37* | .32 | .27 |
| Project provided a valuable learning experience | .14 | .13 | .00 |

*$p < .05 = .36$

TABLE 2

Correlations between Team Performance and Post-Game Perceptions of Team Atmosphere and Performance as a Leader

| Post-Game Perceptions | Team Performance | | |
|---|---|---|---|
| | Assigned Game Score | Ending Owners' Investment | Mean Course Grade |
| Firm President | | | |
| I felt anxious and tense | -.03 | .07 | -.01 |
| Sometimes difficult to communicate with my group | .08 | .01 | .14 |
| Important to me that my firm be among most effective | .35 | .36* | .13 |
| Enjoyed working with other members | .27 | .24 | -.05 |
| In general, close agreement among firm members on decisions | .10 | .08 | -.17 |
| Overall rating of firm performance | .40* | .60* | .18 |
| My own performance as a leader | .33 | .42* | .21 |
| Firm Vice-Presidents | | | |
| I felt anxious and tense | .26 | .19 | .28 |
| Sometimes difficult to communicate with my group | .15 | .03 | .19 |
| Important to me that my firm be among most effective | .07 | .34 | .17 |
| Enjoyed working with other members | .26 | .37* | .36* |
| In general, close agreement among firm members on decisions | .40* | .20 | .15 |
| Overall rating of firm performance | .43* | .58* | .29 |

* $p < .05 = .36$

TABLE 2

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| Sometimes difficult to communicate with my group | .08 | .01 | .14 |
| Important to me that my firm be among most effective | .35 | .36* | .13 |
| Enjoyed working with other members | .27 | .24 | -.05 |
| In general, close agreement among firm members on decisions | .10 | .08 | -.17 |
| Overall rating of firm performance | .40* | .60* | .18 |
| My own performance as a leader | .33 | .42* | .21 |
| Firm Vice-Presidents | | | |
| I felt anxious and tense | .26 | .19 | .28 |
| Sometimes difficult to communicate with my group | .15 | .03 | .19 |
| Important to me that my firm be among most effective | .07 | .34 | .17 |
| Enjoyed working with other members | .26 | .37* | .36* |
| In general, close agreement among firm members on decisions | .40* | .20 | .15 |
| Overall rating of firm performance | .43* | .58* | .29 |

* $p < .05 = .36$

TABLE 3

Correlations between Predictor (Past Performance) Variables and Team Performance

| Predictor Variables | Team Performance | | |
|---|---|---|---|
| | Assigned Game Score | Ending Owners' Investment | Mean Course Grade |
| Mathematics problem, number correct | .22 | .23 | .44* |
| Mathematics problem, time to completion | .19 | -.29 | .35 |
| Gold Dust Problem, successful completion | -.42* | -.24 | -.50* |
| Gold Dust Problem, time to completion | .08 | .05 | .00 |
| Team Mean GPA | .52* | .17 | .20 |

*$p < .05 = .36$

TABLE 4

Analysis of Variance: LPC Scores of Conglomerate and Firm Presidents and Team Members' (Firm Vice-Presidents') Post-Game Perceptions

| Post-Game Perceptions | F Ratios | | |
|---|---|---|---|
| | LPC-CP | LPC-FP | LPC-CPxLPC-FP |
| Game | | | |
| Task (game) was interesting | .01 | .42 | 1.93 |
| Task provided a real challenge | 2.48 | .05 | .05 |
| Task was often very frustrating | 1.71 | .57 | .38 |
| Project provided a valuable learning experience | .23 | 5.03** | .04 |
| Team Atmosphere | | | |
| I felt anxious and tense | .08 | .00 | .32 |
| Sometimes difficult to communicate with my group | .10 | .56 | .05 |
| Important to me that my firm be among the most effective | .38 | .38 | .09 |
| Enjoyed working with other members | .34 | 2.49 | 5.03** |
| In general, close agreement among firm members on decisions | .55 | .86 | 4.18** |
| Overall rating of firm performance | .12 | .05 | .64 |
| Leader | | | |
| As leader, Firm President was considerate | .10 | .89 | 4.86** |
| Firm President was effective in helping firm reach decisions | .14 | .75 | 3.93* |
| Firm President successfully motivated members to perform well | .17 | 1.28 | 3.86* |

* $p < .10$ (df 1/28) = 2.89
** $p < .05$ (df 1/28) = 4.20

Table 5

Analysis of Variance: Team Performance and

LPC Scores of Conglomerate and Firm Presidents

| LPC Scores | F Ratios Team Performance | | |
|---|---|---|---|
| | Assigned Game Score | Ending Owners' Investment | Mean Course Grade |
| LPC - Conglomerate President | .19 | .70 | 3.00* |
| LPC - Firm President | .13 | .20 | .00 |
| LPC - CP x LPC - FP | .41 | .00 | .05 |

*$p < .10$ (df 1/28) = 2.89

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